

LISTING OF CLAIMS

The following listing of claims pending in the application replaces all prior such claim listings.

1. (Original) A composition comprising:

water soluble associative polymer having functionality including at least sulfonate groups, carboxylate groups and hydrophobes associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and

alkali metal salt of carboxylic acid.

2. (Original) The composition of claim 1 wherein the associative polymer is soluble in an amount of at least 0.05 wt. % in a saturated aqueous solution of cesium formate.

3. (Original) The composition of claim 1 wherein the associative polymer is soluble in an amount of at least 0.5 wt. % in a saturated aqueous solution of cesium formate.

4. (Original) The composition of claim 1 wherein the hydrophobes of the associative polymer are hydrocarbon side chains pendant from a backbone of the associative polymer.

5. (Original) The composition of claim 1 wherein the hydrophobes of the associative polymer are aliphatic side chains pendant from a backbone of the associative polymer.

6. (Original) The composition of claim 5 wherein at least a majority of the aliphatic side chains pendant from a backbone of the associative polymer are alkyl side chains.

7. (Original) The composition of claim 6 wherein at least a majority of the alkyl side chains are unsubstituted C4 to C24 alkyl side chains pendant from the backbone of the associative polymer.

8. (Original) The composition of claim 6 wherein at least a majority of the alkyl side chains are unsubstituted C10 to C18 alkyl side chains pendant from the backbone of the associative polymer.

9. (Original) The composition of claim 5 wherein at least a majority of the alkyl side chains are any of stearyl, lauryl and ethylhexyl.

10. (Original) The composition of claim 1 wherein the polymer has a weight average molecular weight of

at least 200,000, and
not more than 5,000,000.

11. (Original) The composition of claim 1 wherein the alkali metal salt of carboxylic acid is selected from alkali metal salts of formic acid, acetic acid and mixtures thereof.

12. (Original) The composition of claim 1 wherein the alkali metal salt of carboxylic acid is selected from sodium, potassium and cesium salts of formic acid, and mixtures thereof.

13. (Previously Presented) The composition of claim 1 wherein
the polymer is at least 0.1 wt. % of the composition, and
the alkali metal salt of carboxylic acid is at least 60.0 wt. % of the composition.

14. (Previously Presented) A composition comprising:
water soluble associative polymer formed as the polymerization reaction product of reactants comprising:

AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them,

alpha, beta-unsaturated carbonyl compound different from the AMPS reactant,
and

hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carbonyl compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them, having a -COOR moiety wherein R is a hydrophobe which, as moieties of the resultant associative polymer, are associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and
alkali metal salt of carboxylic acid.

15. (Previously Presented) The composition of claim 37 wherein the AMPS reactant is selected from 2-acrylamido-2-methylpropanesulfonic acid or salt thereof and 2-methyl-2-[(1-oxo-2-propenyl)amino]-1-propanesulfonic acid or salt thereof.

16. (Previously Presented) A composition comprising:

water soluble associative polymer formed as the polymerization reaction product of reactants comprising:

AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them,

alpha, beta-unsaturated carbonyl compound different from the AMPS reactant,
and

hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carbonyl compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them, having a -COOR moiety wherein R is a hydrophobe which, as moieties of the resultant associative polymer, are associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and

alkali metal salt of carboxylic acid,

wherein the alpha, beta-unsaturated carbonyl compound is selected from; methacrylic acid, maleic acid, fumaric acid, acrylic acid, salts thereof, and a mixture of any of them.

17. (Previously Presented) The composition of claim 37 wherein the hydrophobe reactant is selected from alkyl acrylate, alkyl methacrylate and a mixture of any of them, the alkyl moiety being unsubstituted C4 to C24 alkyl.

18. (Previously Presented) The composition of claim 37 wherein the hydrophobe reactant is selected from alkyl acrylate, alkyl methacrylate and a mixture of any of them, the alkyl moiety being unsubstituted C8 to C18 alkyl.

19. (Previously Presented) The composition of claim 37 wherein the hydrophobe reactant is selected from stearyl methacrylate, lauryl methacrylate, and ethylhexyl methacrylate.

20. (Previously Presented) The composition of claim 37 wherein the hydrophobe associative polymer has:

5 to 95 wt.% structural units derived from the AMPS reactant;

5 to 95 wt. % structural units derived from the alpha, beta-unsaturated carboxylic acid compound; and

0.2 to 2.0 wt.% structural units derived from the hydrophobe reactant.

21. (Previously Presented) The composition of claim 37 wherein the reactants further comprise a cross-linking agent.

22. (Previously Presented) The composition of claim 21 wherein the cross-linking agent is N,N'-methylenebis[2-propenamide].

23. (Original) The composition of claim 21 wherein the water soluble associative polymer has: 0 to 5 wt.% structural units derived from the cross-linking agent.

24. (Previously Presented) The composition of claim 37 further comprising alkali metal salt of at least 1 halide.

25. (Original) The composition of claim 24 wherein the alkali metal salt of at least 1 halide is selected from the sodium, potassium and cesium salts of chloride, bromide and mixtures thereof.

26. (Previously Presented) The composition of claim 37 developing an apparent viscosity of at least 20 cPs, a plastic viscosity of at least 15 cPs, and a yield point of at least 5 lbs/100ft² when dissolved in saturated aqueous cesium formate solution and measured at 120 °F.

27. (Original) The composition of claim 25 retaining at least 30 percent of its apparent viscosity after roller aging for 700 hours at 375 degrees F and measured at 120 degrees F.

28. (Original) Water soluble hydrophobe associative polymer having functionality including at least sulfonate groups, carboxylate groups and hydrophobes associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid.

29. (Previously Presented) The polymerization reaction product of reactants comprising:

5 to 95 wt.% AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them;

5 to 95 wt.% alpha, beta-unsaturated carbonyl compound different from the AMPS reactant; and

0.2 to 2.0 wt.% hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carbonyl compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them.

30. (Previously Presented) The polymerization reaction product of claim 38 wherein the hydrophobe reactant has a -COOR moiety wherein the R moieties, as moieties of the reaction product, are hydrophobes associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid.

31. (Previously Presented) An aqueous well service fluid comprising:
water soluble associative polymer formed as the polymerization reaction product of reactants comprising:
AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them,
alpha, beta-unsaturated carbonyl compound different from the AMPS reactant, and
hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carbonyl compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them, having a -COOR moiety wherein R is a hydrophobe which, as moieties of the resultant associative polymer, are associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and
alkali metal salt of carboxylic acid.
32. (Original) A method comprising introducing into a wellbore a fluid comprising:
water soluble associative polymer having functionality including at least sulfonate groups, carboxylate groups and hydrophobes associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and
alkali metal salt of carboxylic acid.
33. (Original) The method of claim 32 wherein said fluid is exposed to temperatures up to 425 degrees F.
34. (Previously Presented) A method comprising introducing into a wellbore a fluid comprising
water soluble associative polymer formed as the polymerization reaction product of reactants comprising:
AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them,

alpha, beta-unsaturated carbonyl compound different from the AMPS reactant, and

hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carbonyl compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them, having a -COOR moiety wherein R is a hydrophobe which, as moieties of the resultant associative polymer, are associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and
alkali metal salt of carboxylic acid.

35. (Previously Presented) A composition comprising:

water soluble associative polymer formed as the polymerization reaction product of reactants comprising:

AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them,

alpha, beta-unsaturated carboxylic acid compound, and

hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them, having a -COOR moiety wherein R is a hydrophobe which, as moieties of the resultant associative polymer, are associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and
alkali metal salt of carboxylic acid.

36. (Previously Presented) The polymerization reaction product of reactants comprising:

5 to 95 wt.% AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them;

5 to 95 wt.% alpha, beta-unsaturated carboxylic acid compound; and

0.2 to 2 wt.% hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them.

37. (Previously Presented) A composition comprising:

water soluble associative polymer formed as the polymerization reaction product of reactants comprising:

AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them,

alpha, beta-unsaturated carboxylic acid compound different from the AMPS reactant, and

hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carboxylic acid compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them, having a -COOR moiety wherein R is a hydrophobe which, as moieties of the resultant associative polymer, are associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and
alkali metal salt of carboxylic acid.

38. (Previously Presented) The polymerization reaction product of reactants comprising:

5 to 95 wt.% AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them;

5 to 95 wt.% alpha, beta-unsaturated carboxylic acid compound different from the AMPS reactant; and

0.2 to 2.0 wt.% hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carboxylic acid compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them.

39. (Previously Presented) An aqueous well service fluid comprising:

water soluble associative polymer formed as the polymerization reaction product of reactants comprising:

AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them,

alpha, beta-unsaturated carboxylic acid compound different from the AMPS reactant, and

hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carboxylic acid compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them, having a -COOR moiety wherein R is a hydrophobe which, as moieties of the resultant associative polymer, are associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and
alkali metal salt of carboxylic acid.

40. (Previously Presented) A method comprising introducing into a wellbore a fluid comprising

water soluble associative polymer formed as the polymerization reaction product of reactants comprising:

AMPS reactant selected from acrylamidomethylpropanesulfonic acid, salts thereof and a mixture of any of them,

alpha, beta-unsaturated carboxylic acid compound different from the AMPS reactant, and

hydrophobe reactant different from the AMPS reactant and different from the alpha, beta-unsaturated carboxylic acid compound, the hydrophobe reactant selected from acrylic esters, methacrylic esters and a mixture of any of them, having a -COOR moiety wherein R is a hydrophobe which, as moieties of the resultant associative polymer, are associative with one another in a saturated aqueous solution of an alkali metal salt of a carboxylic acid; and
alkali metal salt of carboxylic acid.

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